STS-111 (BI113)
FLIGHT READINESS REVIEW

PROGRAM

May 16, 2002

Solid Rocket Booster

United Space Alliance

TECHNICAL ISSUE - DISLODGED IEA CAPACITOR

Presenter:
Robert Wright
Organization/Date:
USA-SRB/5-16-02

Issue

- Capacitor found loose inside Power Bus Isolation Supply (PBIS) module in Integrated Electronic Assembly (IEA) S/N 9309075

Concern

- Missing capacitor may lead to loss of power bus
  - Criticality 1R failure
- FOD in PBIS may cause shorting and loss of power bus
  - Criticality 1R failure
  - Smart short could bring down SRB A or B bus

Background

- Loose capacitor found during IEA ATP post vibration testing
  - IEA passed full functional test at ambient temperature
  - IEA exposed to ATP vibration levels in each axis
  - IEA failed first cold temperature test after vibration
    - Fuel Shutoff Valve Drive AC test failure
      - 235 mVac ripple observed
      - 100 mVac allowable

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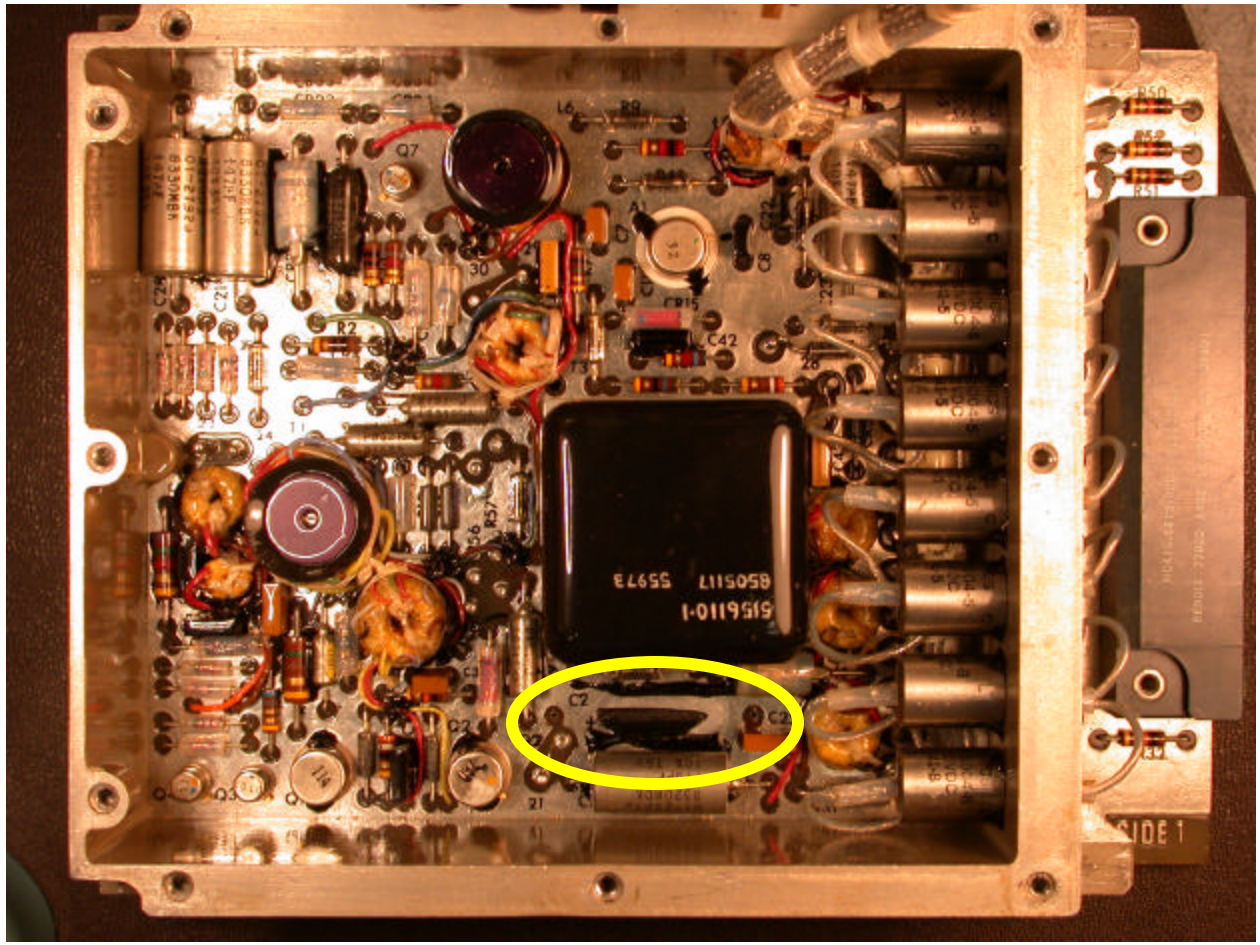

PBIS S/N 8508059 A1 Circuit Card Assembly

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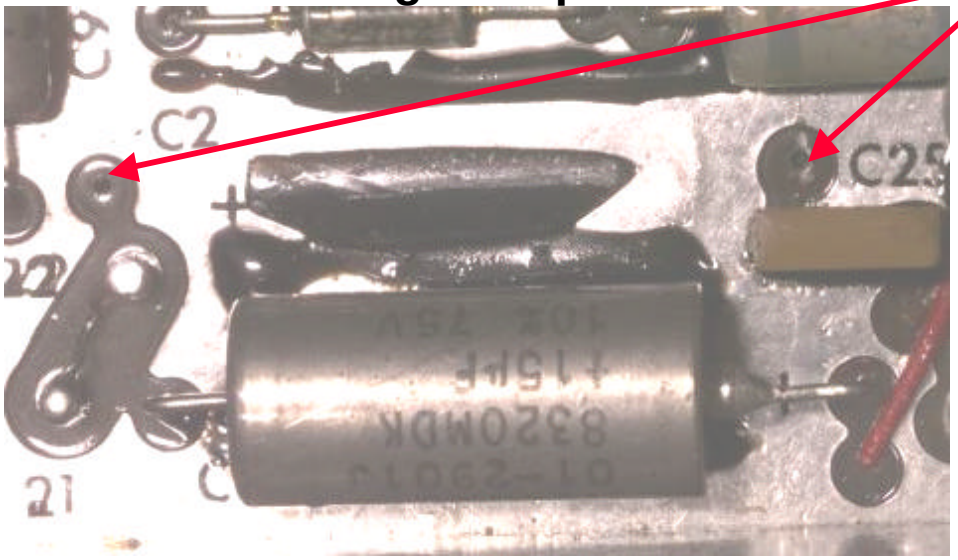
Dislodged Capacitor



Mounting Locations

PBIS Module

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Discussion (cont.)

- Formal anomaly resolution team formed to investigate failure
- Dislodged capacitor staking is suspect cause of failure
  - No causative contamination found
  - Chemical composition of staking acceptable
  - Inspection of five additional PBIS cards performed
    - Subject IEA B channel card revealed acceptable staking
    - Inspection of IEA 29 shows acceptable capacitor staking
    - No dislodged capacitors found in IEA 9 qualification unit, all had acceptable staking
      - Subject to vibration testing of over 60 simulated missions
  - Less staking compound observed on failed capacitor (30% - 40% less material)
    - Subject capacitor only occurrence out of 30 inspections
      - Not a generic component staking process issue

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Risk Assessment (cont.)

- Conservative reliability assessment performed
  - Analysis based on demonstrated reliability
  - Results in 1 mission loss in 232,072 flights
    - Mission loss defined as loss of both bus A and B in either forward or aft IEA or loss of one bus in one IEA and loss of alternate bus in other IEA

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Rationale for Flight

- All critical systems redundant by design
- IEA redundancy verification screen performed during Shuttle Interface Testing
- No evidence of generic process failure of component staking
- Broken/missing capacitor in failed location detectable during acceptance testing for all installed aft IEAs
- Demonstrated survivability by design with adequate staking applied
- Mission risk 1 in 200,000+ based on reliability analysis
- STS-111 is safe to fly

STS-111 (BI113) Flight Readiness Review

Pending completion of normal operations flow, we certify the Booster Assembly hardware ready to support the launch of STS-111

Original signed by Dale Nash

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United Space Alliance